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Dendrobium suzukii (Orchidaceae) - A New Species from Vietnam

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A new orchid species, *Dendrobium suzukii* Yukawa, is described from Vietnam. It is easily distinguished from the closely related *Dendrobium cruentum* Rchb. f. by the following combination of characters: 1) much larger perianth lobes; 2) a semiglobose callus on the basal part of the labellum; 3) five keels on the labellum; 4) undulate margins on the mid lobe of the labellum; 5) a wider callus with cristate protuberances on the mid lobe of the labellum. Molecular phylogenetic analyses of the ITS (internal transcribed spacer) region of the 18S-26S nuclear ribosomal DNA also support a separate taxonomic status of the new species and its sister group relationship to *D. cruentum*.

Key words: *Dendrobium suzukii*, ITS, molecular phylogeny, new species, Orchidaceae, taxonomy, Vietnam

Dendrobium Sw. section *Formosae* (Benth. & Hook. f.) Hook. f. is a horticulturally important group to which about 40 species are currently assigned. Species belonging to this section are found from the Himalaya in the west to the Philippines and Borneo in the east. Section *Formosae* is usually defined by the black hairs on the leaf blades and leaf sheaths. Most species from the Philippines and Borneo, however, do not exhibit this feature. In fact, only the hard-textured flowers with white, greenish or yellow perianth lobes characterize the section. Phylogenetic analyses of macromolecular characters have indicated that this section does not represent a monophyletic group (Wongsawad *et al.* 2001, Yukawa 2001, unpublished). A new species from Vietnam, belonging to section *Formosae*, is described below. In this study molecular phylogenetic analyses were also used to clarify the phylogenetic status of the new species.

Materials and Methods

Materials used in the phylogenetic analyses are shown in Table 1. *Dendrobium cruentum* Rchb. f. and *D. tobaense* J. J. Wood & J. B. Comber were included in the study because those two species show close relationships to the new species on the basis of synapomorphic morphological characters such as flower colour, shape of the side lobes of the labellum, and shape of the mentum. A single more distantly related species in section *Formosae*, *D. formosum*, was chosen as the outgroup taxon. Voucher specimens are deposited at TNS.

Experimental methods were described in Yukawa *et al.* (1993, 1996). Sequences were determined by amplifying the ITS (internal transcribed spacer) region of the 18S-26S nuclear ribosomal DNA via the polymerase chain reaction (PCR) from a total DNA extract. All of the primers were from Douzery *et al.* (1999). DNA

TABLE 1. Taxa used for ITS sequencing.

Species	Voucher
Dendrobium cruentum Rchb. f.	*TBG134572**
Dendrobium formosum Roxb. ex Lindl.	*TBG100241*
Dendrobium suzukii Yukawa	*T. Sato s. n.*
Dendrobium tobaense J. J. Wood. & J. B. Comber	*TBG126681*

* TBG series indicate accession numbers of the living collection database at Tsukuba Botanical Garden.

sequences were aligned manually. Gaps were treated as missing characters. The aligned data file is available from the author upon request. Parsimony and distance analyses were conducted with PAUP* version 4.0b6 (Swofford 2001). The branch and bound search option was used to perform Fitch parsimony analyses (Fitch 1971). Branch lengths for trees were calculated using the ACCTRAN optimization (Swofford & Maddison 1987). Distance trees were obtained using the neighbor-joining method (Saitou & Nei 1987) with a Kimura two-parameter correction (Kimura 1980). To assess the relative robustness for branches, the bootstrap method (Felsenstein 1985) was used with 10000 replicates.

Results and Discussion

Description of the new species

Dendrobium suzukii Yukawa, **sp. nov.**

Affine *Dendrobio cruento* Rchb. f., sed floribus valde majoribus, disco labelli quinquecarinato et cristato, callo labelli semiglobosus, et marginibus labelli undulates distinguendum.

Type: VIETNAM. Ninh Thuân Province, in the vicinity of Ninh Son. Flowering in cultivation August 2001, *Hort. T. Sato s. n.* (Holotype: TNS). Figs. 1, 2.

Paratype: VIETNAM. Lâm Dong Province, alt. ca. 1000 m. *S. Khruekerd KV-0011* (TNS).

Plant to 27 cm tall. **Stems** cane-like, clustered, erect, narrowly fusiform, slightly flattened, weakly sulcate in age, leafy throughout, tightly covered by persistent leaf sheaths, to 23 cm long, 0.8 cm in diameter. **Leaves** patent, coriaceous, glossy, oblong-lanceolate, sessile, apex unequally bilobed, dark green, both surfaces with dense blackish hairs, 2.1-7.3 cm long, 0.8-2.2 cm wide; sheaths clasping, thin, dull green with dense blackish hairs, 0.3-3.2 cm long. **Inflorescence** suberect-patent, axillary on apical half of foliate stems, bearing 1 or 2 flowers successively; peduncle inconspicuous, entirely enclosed by bracts, 4 mm long; rachis 4 mm long; floral bracts obliquely lanceolate, acuminate, concave, brownish, abaxial surface with dense brown hairs, adaxial surface glabrous, to 14.5 mm long, 4.5 mm wide. **Flowers** widely opening, glossy, thick, rigid; sepals and petals pale yellowish green, veins darker; labellum pale yellowish green, side lobes and thickened areas sanguine; column and anther cap pale green; column foot pale green stained sanguine; pollinia orangish yellow; pedicellate ovary grass green. **Dorsal sepal** lanceolate, acute, mucronate, 35-40 mm long, 14.5-16 mm wide. **Lateral sepals** obliquely triangular-lanceolate, acute, mucronate, abaxial surface costate, 39-40 mm long along anterior margin, 19-21 mm wide at base; mentum obtuse, making a right angle with ovary, 16-17.5 mm long. **Petals** linear-lanceolate, acute, 31-33 mm long, 7.5-9 mm wide. **Labellum** three-lobed, shortly clawed, five-

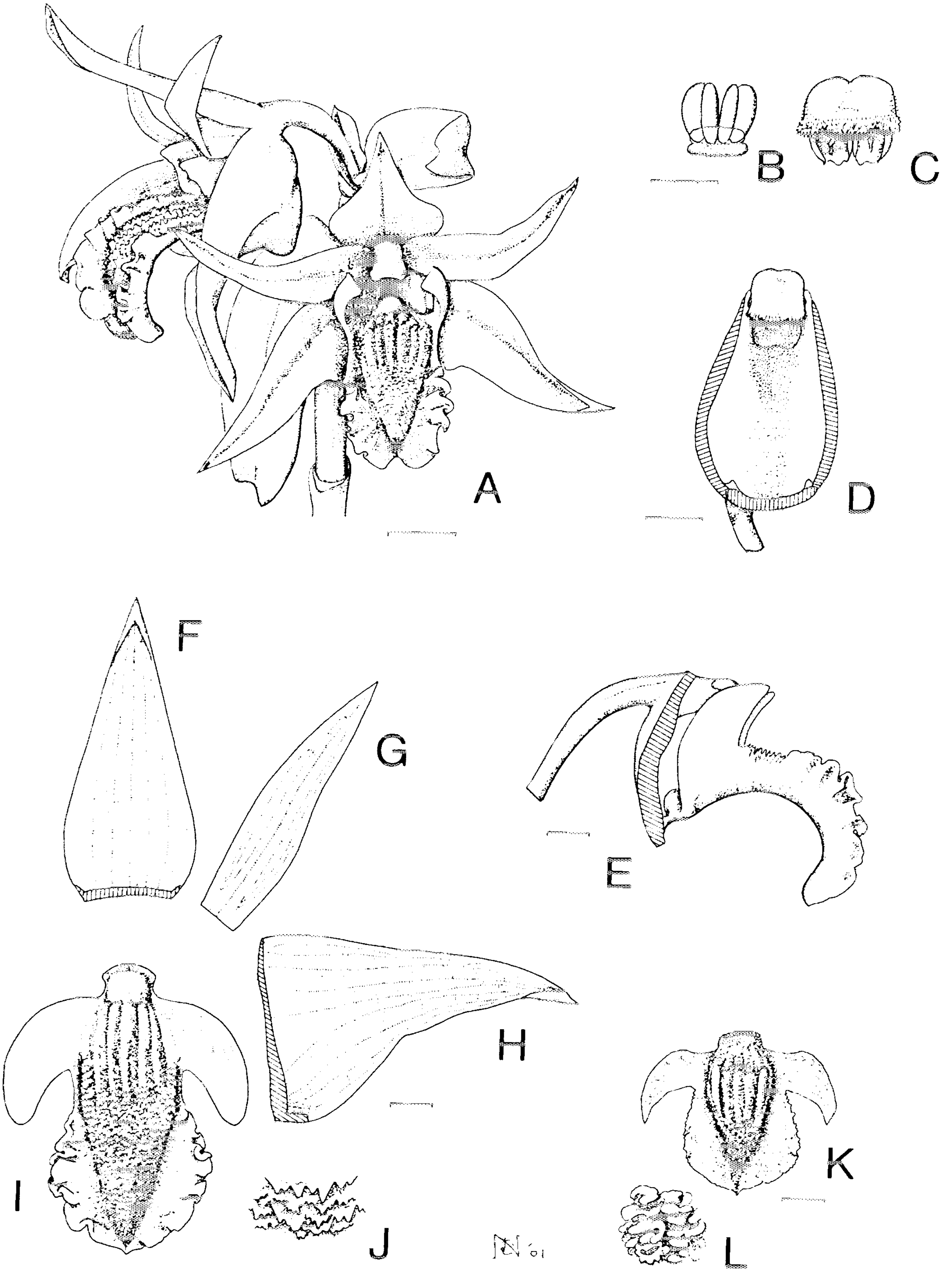

FIG. 1. Flowers of *Dendrobium suzukii* Yukawa (A-J) and *Dendrobium cruentum* Rchb. f. (K, L). A. Flower, front view; B. Pollinium; C. Anther cap; D. Column and column foot, from below; E. Labellum and column, side view; F. Dorsal sepal; G. Petal; H. Lateral sepal; I. Labellum; J. Closeup of callus on mid lobe of labellum; K. Labellum; L. Closeup of callus on mid lobe of labellum. Drawn from holotype (*T. Sato s. n.*) by M. Nakajima. Scale bar = 1 cm (A), 5 mm (D-I, K), or 3 mm (B, C).

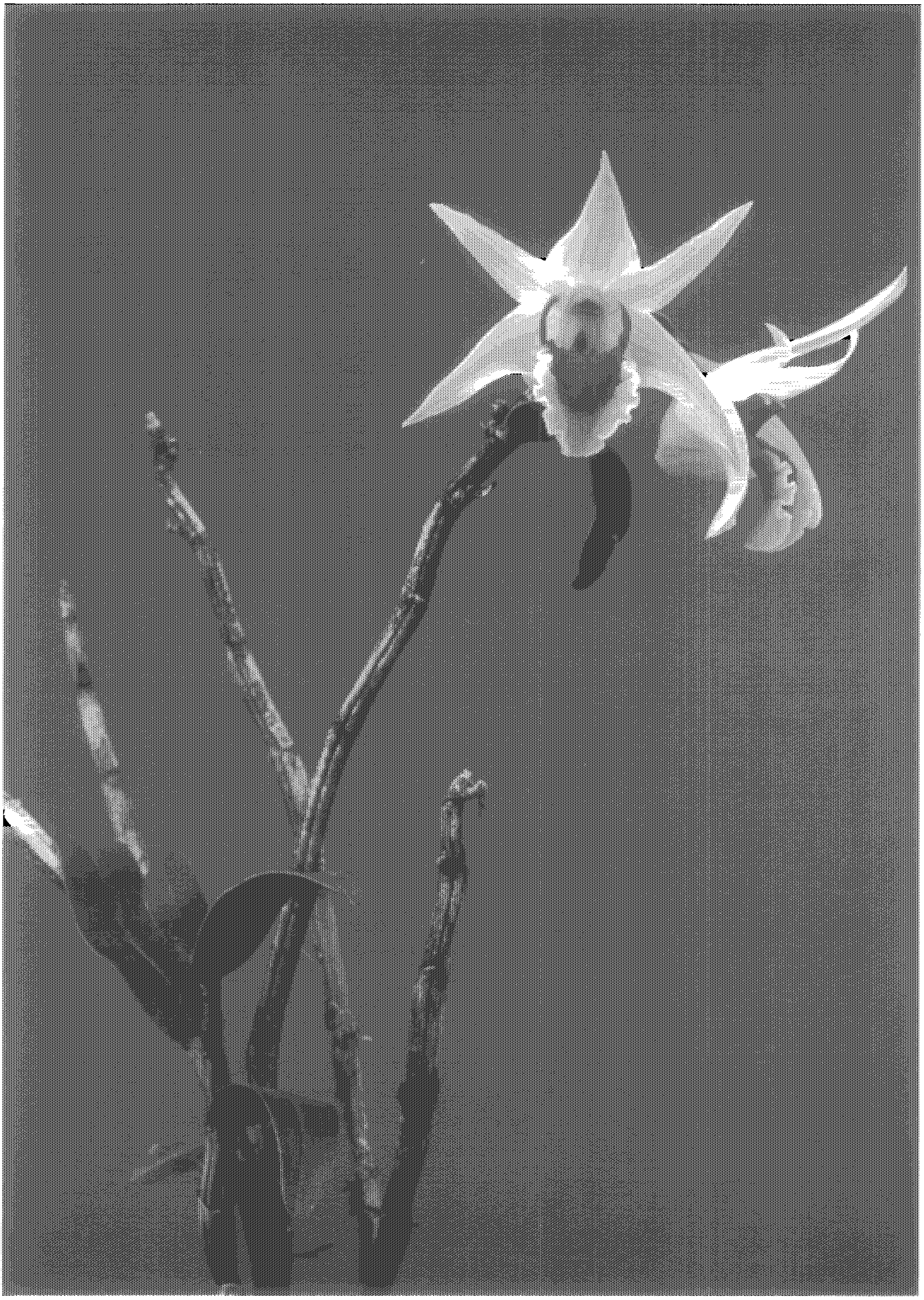

Fig. 2. Flowering individual of *Dendrobium suzukii* Yukawa. Photograph from holotype (*T. Sato s. n.*).

keeled between side lobes, with a semiglobose callus at base, 33 mm long, 28 mm wide; side lobes erect, falcate, obtuse, 10-12 mm long, 7.5-9 mm wide; mid lobe obovate, obtuse, undulate, apical part of adaxial surface papillose, rugose, with a cristate callus at centre of adaxial surface, abaxial surface shallowly sulcate, 21.5-22 mm long, 15-18 mm wide. **Column** dilated at base, 5 mm long, 6.5 mm wide at base; stelidia short, triangular, obtuse; column foot slightly curved, basally grooved, 11 mm long; anther cap cucullate, quadrate, hirsute below, 3.8 mm long, 3.8 mm wide; pollinia 4, in 2 pairs, orangish yellow, 3 mm long. **Pedicellate ovary** narrowly clavate, weakly sulcate, glabrous, 23 mm long.

Etymology: The specific epithet honours Kazuhiro Suzuki of Tsukuba Botanical Garden, who noticed the distinctiveness of this species.

Dendrobium suzukii is most similar to *D. cruentum* but can be distinguished by the following characters: 1) much larger perianth lobes; 2) a semiglobose callus on the basal part of the labellum; 3) five, instead of three, keels on the labellum; 4) undulate margins on the mid lobe of the labellum; 5) a wider callus with cristate, instead of verrucose, protuberances on the mid lobe of the labellum.

Dendrobium suzukii was found more than 1000 km from the central part of the Malay Peninsula where *D. cruentum* was collected (Seidenfaden 1985). The other closely related species, *D. tobaense* is known only from the northern part of Sumatra. *Dendrobium suzukii* is geographically isolated from those closely related species.

Nine species of *Dendrobium* section *Formosae* have been recorded from Vietnam (Seidenfaden 1992), but *D. suzukii* is easily discriminated from them by flower colour and structure of the callus on the labellum.

Phylogenetic analyses

Nine nucleotide positions were potentially informative out of 917 bp of the 18S (in part)-ITS 1-5.8S-ITS 2-26S (in part) sequences determined. The parsimony analysis resulted in a single most parsimonious tree of 78 steps (Fig. 3) that showed a sister group relationship between *Dendrobium suzukii* and *D. cruentum*. The tree had a consistency index (CI) of 0.9359 (0.6429 excluding uninformative characters) and a retention index (RI) of 0.4444. The neighbor-joining

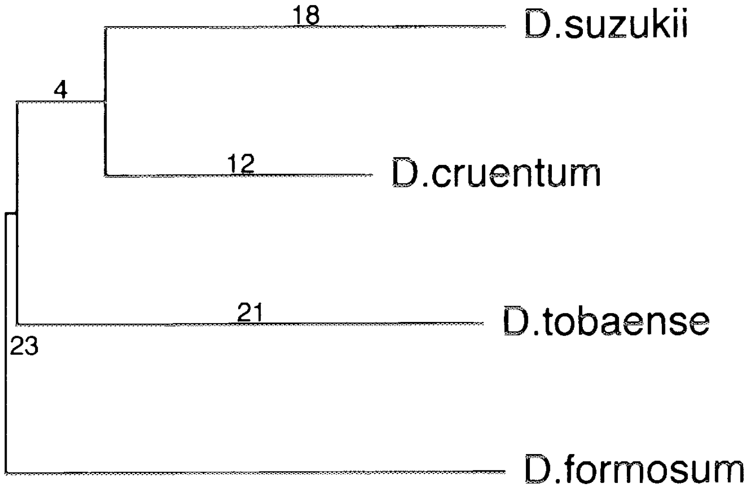

FIG. 3. Single most parsimonious Fitch tree based upon ITS sequences: length 78, consistency index 0.9359 (0.6429 excluding uninformative characters), retention index of 0.4444. Numbers above internodes indicate nucleotide substitutions supporting each monophyletic group (ACCTRAN optimization).

topology was identical (results not shown). The bootstrap analyses moderately supported the sister group relationship between *D. suzukii* and *D. cruentum* (58% support for the parsimony analysis, 49% support for the neighbor-joining analysis). The number of base differences and sequence divergences within the ITS region were as follows: *D. suzukii-D. formosum*: 38, 0.0810; *D. suzukii-D. cruentum*: 28, 0.0592; *D. suzukii-D. tobaense*: 38, 0.0803. Based on these molecular characters, *D. suzukii* is distinct from closely related species by its unique base substitutions in the ITS region and appears to have a sister group relationship with *D. cruentum*.

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